

**R E M A R K S**

The Office Action of December 13, 2001, presents the examination of claims 1-6 and 10. Claims 1, 5, and 6 are amended. Claim 11 is added. Support for claim 11 is found in claims 5 and 6. No new matter is inserted into the application.

***Drawings***

The Draftsman objects to the drawings. Applicants submit new formal drawings under separate cover. Thus, the objections to the drawings are overcome.

***Claim Objections***

The Examiner objects to claim 6 for reciting "or" in line 8. Applicants respectfully traverse. Reconsideration of the claim and withdrawal of the instant objection are respectfully requested.

In response to the Examiner's remarks, Applicants amend "or" to "and" as suggested by the Examiner. Thus, the instant objection is overcome.

**Rejection under 35 U.S.C. § 112, first paragraph**

Written Description

The Examiner rejects claims 5 and 6 under 35 U.S.C. § 112, first paragraph, for allegedly containing subject matter not described in the specification as filed. Applicants respectfully traverse. Reconsideration of the claims and withdrawal of the instant rejection are respectfully requested.

Claim 5 is directed to a mutant  $\alpha$ -amylase obtained by introducing two kinds of mutations into SEQ ID NO:1 or an amino acid sequence having at least 70% homology to SEQ ID NO:1, wherein a first mutation is a substitution or a deletion of at least one amino acid residue selected from the group consisting of the 11<sup>th</sup> Tyr, 16<sup>th</sup> Glu, 49<sup>th</sup> Asn, 84<sup>th</sup> Glu, 144<sup>th</sup> Ser, 167<sup>th</sup> Gln, 169<sup>th</sup> Tyr, 178<sup>th</sup> Ala, 188<sup>th</sup> Glu, 190<sup>th</sup> Asn, 205<sup>th</sup> His and 209<sup>th</sup> Gln, and wherein a second mutation is a substitution of a sequence corresponding to 11 to 100 amino acid residues from the amino terminus of the amino acid sequence set forth in SEQ ID NO:1, and wherein said mutant  $\alpha$ -amylase possesses increased heat resistance and maintains resistance to chelating agents when compared to SEQ ID NO:1. Claim 6 is directed to the mutant  $\alpha$ -amylase according to Claim 5, wherein said first mutation comprises: the substitution of an amino acid residue selected from the group consisting of: the 11<sup>th</sup> Tyr of SEQ ID NO:1 with

Phe, the 16<sup>th</sup> Glu of SEQ ID NO:1 with Pro, the 49<sup>th</sup> Asn of SEQ ID NO:1 with Ser, the 167 Gln of SEQ ID NO:1 with Glu, the 169<sup>th</sup> Tyr of SEQ ID NO:1 with Lys, the 190<sup>th</sup> Asn of SEQ ID NO:1 with Phe, the 205<sup>th</sup> His of SEQ ID NO:1 with Arg, and the 209<sup>th</sup> Gln of SEQ ID NO:1 with Val, and wherein said second mutation comprises: substituting an amino terminal sequence from 1<sup>st</sup> Asp through 19<sup>th</sup> Gly of SEQ ID NO:1 with an amino acid sequence from 1<sup>st</sup> His to 21<sup>st</sup> Gly of SEQ ID NO:2.

The Examiner asserts that the recitation of "at least two mutations" renders the claims open to any number of mutations and represents an enormous genus of mutant  $\alpha$ -amylases. In order to answer this rejection, Applicants amend the phrase "at least two mutations" with "two kinds of mutations" in claims 5 and 6. Support for this amendment is found on page 8, lines 3-10.

Applicants respectfully submit that claims 5 and 6 fully comply with the requirements of 35 U.S.C. § 112, first paragraph for written description. Withdrawal of the instant rejection is respectfully requested.

#### Enablement

The Examiner rejects claims 1-6 and 10 under 35 U.S.C. § 112, first paragraph, for allegedly containing subject matter not enabled by the specification. Applicants respectfully traverse.

Reconsideration of the claims and withdrawal of the instant rejection are respectfully requested.

Specifically, the Examiner asserts that the specification does not enable a mutant  $\alpha$ -amylase having 70% or less homology with SEQ ID NO:1.

Claim 1 is amended to clarify that the resulting mutant  $\alpha$ -amylase is at least 70% homologous to SEQ ID NO:1. As such, the instant claims do not encompass sequences having less than 70% homology to SEQ ID NO:1. For this reason, the rejection is overcome.

***Rejection under 35 U.S.C. § 112, second paragraph***

The Examiner maintains the rejection of claim 5 under 35 U.S.C. § 112, second paragraph, for allegedly being indefinite. Applicants respectfully traverse. Reconsideration of the claims and withdrawal of the instant rejection are respectfully requested.

Specifically, the Examiner asserts that the recitation of "at least one amino terminal sequence from 1<sup>st</sup> Asp through 11<sup>th</sup> Tyr or 100<sup>th</sup> Asp" is unclear. In response to the Examiner's remarks, Applicants delete said phrase and replace therefor with "a sequence corresponding to 11 to 100 amino acid residues from the amino terminus of the amino acid sequence set forth in SEQ ID NO:1." This phrase is similar to that used in claim 2, and

supported by the specification, for example on page 7, lines 12-20.

Applicants respectfully submit that claim 5, as amended, fully complies with the requirements of 35 U.S.C. § 112, second paragraph. Withdrawal of the instant rejection is respectfully requested.

***Allowable Subject Matter***

The Examiner states that claim 6 would be allowable if rewritten into independent form and amended to recite a mutant "consisting of" the first and second mutations. In response to the Examiner's remarks, Applicants submit the Examiner's suggested claim 6 as new claim 11. The Examiner is respectfully requested to at least acknowledge the allowability of claim 11.

***Conclusion***

Applicants respectfully submit that the above remarks and/or amendments address and overcome all of the Examiner's objections and rejections such that the present application is in a condition for allowance. Early and favorable action of the merits of the present application is thereby respectfully requested.

If there are any minor matters precluding allowance of the application which may be resolved by a telephone discussion, the

Examiner is respectfully requested to contact Kristi L. Rupert, Ph.D. (Reg. No. 45,702) at (703) 205-8000.

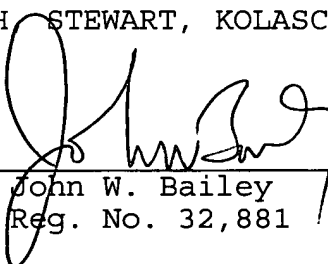
Pursuant to the provisions of 37 C.F.R. §§ 1.17 and 1.136(a), the Applicants hereby petition for an extension of one (1) month to November 30, 2002, in which to file a reply to the Office Action. The required fee of \$110.00 is enclosed herewith.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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By



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Attachment: Version with Markings to Show Changes Made

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

In the Claims:

The claims have been amended as follows:

1. (Twice Amended) A mutant  $\alpha$ -amylase obtained by making a substitution or deletion of at least one amino acid residue of specific positions in SEQ ID NO:1, or by making a substitution or deletion of at least one amino acid residue corresponding to the above-mentioned amino acid residue in a sequence having at least 70% homology to SEQ ID NO:1,

wherein said at least one amino acid residue is selected from the group consisting of:

the 11<sup>th</sup> Tyr, 16<sup>th</sup> Glu, 49<sup>th</sup> Asn, 84<sup>th</sup> Glu, 144<sup>th</sup> Ser, 167<sup>th</sup> Gln, 169<sup>th</sup> Tyr, 178<sup>th</sup> Ala, 188<sup>th</sup> Glu, 190<sup>th</sup> Asn, 205<sup>th</sup> His and 209<sup>th</sup> Gln, and

said mutant  $\alpha$ -amylase possesses increased heat resistance and maintains resistance to chelating agents when compared to SEQ ID NO:1, and

said mutant  $\alpha$ -amylase comprises an amino acid sequence which is at least 70% homologous to SEQ ID NO:1.

5. (Twice Amended) A mutant  $\alpha$ -amylase obtained by introducing [at least] two kinds of mutations into SEQ ID NO:1 or

an amino acid sequence having at least 70% homology to SEQ ID NO:1,

wherein a first mutation is a substitution or a deletion of at least one amino acid residue selected from the group consisting of the 11<sup>th</sup> Tyr, 16<sup>th</sup> Glu, 49<sup>th</sup> Asn, 84<sup>th</sup> Glu, 144<sup>th</sup> Ser, 167<sup>th</sup> Gln, 169<sup>th</sup> Tyr, 178<sup>th</sup> Ala, 188<sup>th</sup> Glu, 190<sup>th</sup> Asn, 205<sup>th</sup> His and 209<sup>th</sup> Gln, and

wherein a second mutation is a substitution of a sequence corresponding to 11 to 100 amino acid residues from the amino terminus of the amino acid sequence set forth in SEQ ID NO:1 [at least one amino terminal sequence from 1<sup>st</sup> Asp through 11<sup>th</sup> Tyr or 100<sup>th</sup> Asp], and

wherein said mutant  $\alpha$ -amylase possesses increased heat resistance and maintains resistance to chelating agents when compared to SEQ ID NO:1.

6. (Twice Amended) The mutant  $\alpha$ -amylase according to Claim 5, wherein said first mutation comprises:

the substitution of an amino acid residue selected from the group consisting of: the 11<sup>th</sup> Tyr of SEQ ID NO:1 with Phe, the 16<sup>th</sup> Glu of SEQ ID NO:1 with Pro, the 49<sup>th</sup> Asn of SEQ ID NO:1 with Ser, the 167 Gln of SEQ ID NO:1 with Glu, the 169<sup>th</sup> Tyr of SEQ ID NO:1 with Lys, the 190<sup>th</sup> Asn of SEQ ID NO:1 with Phe, the 205<sup>th</sup>



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His of SEQ ID NO:1 with Arg, [or] and the 209<sup>th</sup> Gln of SEQ ID NO:1 with Val,

and wherein said second mutation comprises:

substituting an amino terminal sequence from 1<sup>st</sup> Asp through 19<sup>th</sup> Gly of SEQ ID NO:1 with an amino acid sequence from 1<sup>st</sup> His to 21<sup>st</sup> Gly of SEQ ID NO:2.

Claim 11 is added.